

## II. REMARKS

After amending and adding claims as set forth above, claims 1-36 are now pending in this application. A detailed listing of these claims is presented with an appropriate defined status identifier. Support for the new claims are found throughout the specification, e.g., for claims 29 and 34, in page 13, line 19 and in original claim 17; for claims 30 and 35 in Example 1 and original claim 14; for claims 31 and 36, in Example 1 and in original claim 1; and for claims 32 and 33, in Example 1 and in original claim 1.

Applicants respectfully request reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow.

### **Claim Rejections - 35 U.S.C. § 103(a)**

#### **1. Nonninger, Mukherjee, and Bitterlich**

Claim 1 and claims 2-28 depending from claim 1 are rejected as allegedly unpatentable over Nonninger *et al.* (US Pat. App. No. 2004/0115416), in view of Mukherjee *et al.* (Ceramics International 27 (2001) 731-739); and Bitterlich *et al.* (Ceramics International 28 (2002) 675-683). Applicants respectfully disagree.

Claim 1 recites, inter alia, a polymer solution. Claim 1 also recites that, to make the dip casting slurry, a dispersant is added to the oxide powder before a polymer solution is added to the powder. Nonninger, the Office alleges, is the primary reference which teaches "the lion's share of claim 1." Final Office Action mailed July 31, 2009, at page 18. However the Office acknowledges that Nonninger does not teach a polymer solution, and that it also does not teach that the polymer solution is added to suspended metal oxide powders after a dispersant is added to the suspension. (Final Office Action page 4, item 8).

Therefore the Office cites two references to teach these elements recited in claim 1 but missing from what Nonninger teaches. The Office cites Bitterlich for teaching a polymer solution, and cites Mukherjee for teaching “the sequence of adding the dispersant and polymer is critical . . . .” See, e.g., Advisory Action mailed on February 12, 2010, page 2. However as discussed below, Bitterlich and Mukherjee fail to teach these missing elements.

**A. Objectively, a sol or a polymer solution is different from a suspension or a dispersion.**

While claim 1 recites a polymer solution, Bitterlich only teaches a polymer dispersion. For the reasons discussed below, for inhomogenous mixtures, a sol or a polymer solution refers to a different type of a mixture compared to a suspension or a dispersion.

Inhomogenous mixtures may be of two different types, a sol or a polymer solution, and a dispersion or a suspension. For example, a sol or a polymer solution may appear homogenous, or clear, to the naked eye. Upon standing, it may also not form a precipitate. In contrast, a suspension or a dispersion, appears unclear and inhomogenous to the naked eye. Upon standing, it is more likely to form a precipitate.

The specification supports such a distinction. When metal oxide powders are suspended in water, the specification refers to such inhomogenous mixtures as suspensions or dispersions. See e.g., page 10, lines 5 and 33-35, page 11, line 4, page 12, lines 3-4, and page 17, lines 12-13. In contrast, when a polymer is apparently dissolved in a solvent, the specification refers to it as polymer solution. See e.g., page 12, line 20, page 13, line 17, page 13, lines 22-23, and Example 1, page 24, subsection b.

The objective understanding of these terms in the art, and the teaching provided by the specification, unambiguously distinguishes Bitterlich's dispersion from the polymeric solution recited in claims 1 and 34. The subjective teachings of the Graham and Scholtz references, cited by the Examiner to assert "the art has recognized emulsions, and colloidal dispersions as solutions (Advisory Action at page 2, item 2)," are specific to those inventions, and do not alter this objective distinction.

For these reasons, Bitterlich does not teach a polymer solution.

**B. Because the slurry in Mukherjee was wet milled for twenty four hours even after the addition of a dispersant, Mukherjee does not teach the purpose or the importance of the sequence of adding the dispersant to powdered metal oxide suspended in a liquid.**

Claim 1 recites that to make the dip casting slurry, a dispersant is added to the oxide powder before a polymer solution is added to the powder. Mukherjee teaches in section 2.2, entitled "slurry preparation":

[t]he powder was first milled in solvent containing a dispersant using  $ZrO_2$  as a milling media for 12 hours. This step breaks down agglomerates which may be present in the powder. In the second step, the required amount of binder and plasticizers were added to the suspension and milled for another 24 h before final casting or rheological measurements.

Emphasis added.

The very purpose of wet milling is to break up and keep the oxide particles separate. According to Mukherjee, since the wet milling is continued long after adding the dispersant to the powder, Mukherjee does not teach that adding merely the dispersant to the powder, as recited in step a) of claim 1, is sufficient to keep the

particles separate. Mukherjee also teaches that the dispersant and the powder must be milled for prolonged periods together with any other material, such as binders and plasticizers, that need to be added to the powder. Therefore, Mukherjee does also not teach that the sequence in which to mix the dispersant, the powder, and another material may be of any importance. Such teaching is in direct contrast to the Examiner's assertion that, "the sequence of adding the dispersant and polymer is critical, as taught by [Mukherjee] (Advisory Action at page 2.)," and also in direct contrast to what steps a) and b) of claim 1 recite.

As Mukherjee teaches, the dispersant acts on primary particles generated upon breakdown of hard agglomerates during the ball milling stage. There is no suggestion in Mukherjee that would lead the skilled artisan to simply add a dispersant to oxide powder and withdraw the wet milling.

**C. Since Nonninger requires an oxycarboxylic acid in the slurries, claims 31 and 36 that exclude such oxycarboxylic acids are patentable.**

New claims 31 and 36 specifically exclude an oxycarboxylic acid. As noted before (see response to first Office Action at page 11, and the final Office Action at pages 15 and 16), the slurries of Nonninger include at least an oxycarboxylic acid (see paragraph [0015] and end of paragraph [0019]), which, in turn, is excluded from the material within claims 31 and 36. Section 103 does not countenance the combining of references in a manner that, as here, would contravene an express teaching of the primary reference, *i.e.*, would purport to modify Nonninger's slurries to omit a required element, the oxycarboxylic acid. See MPEP 2143.01, subsection vi (*quoting In re Ratti*, 270 F.2d 810, 813 (C.C.P.A. 1959)). Accordingly, it would be improper to combine Nonninger with Mukherjee and Bitterlich, regardless of the latter two's teachings, in an effort to arrive at claims 31 and 36.

**D. Since Bitterlich and Mukherjee require rigorous milling, new claims 32 and 33-36 that exclude milling are patentable.**

New claims 32, explicitly, and 33-36, impliedly, exclude milling. Mukherjee (section 2.2, entitled "[s]lurry preparation") and Bitterlich (section 2.1 entitled "[s]tarting materials and slurry formulation") require prolonged wet milling as an essential feature of the slurry preparation. Therefore, to arrive at a process that excludes milling, there is no motivation for the skilled artisan to look into what Mukherjee or Bitterlich teaches, and none of them may properly be combined to reject claims 32 and 33-36.

**E. The rejected and the new claims are patentable.**

Because the prior art references, in the aggregate, do not teach each and every element of the claimed invention as prescribed in claim 1 and new claims 29, 30, and 33, the Office fails to establish a prima facie case of obviousness with respect to them and they are patentable. Withdrawal of the rejection of claim 1, and claims 2-28 dependent thereon, is therefore respectfully requested.

New independent claim 29 recites what claim 1 recites and adds another element, based on the mass ratio  $r_m$ . The  $r_m$  range recited in claim 29 adds yet another element that is not disclosed in the cited art. See page 13, lines 19-22 and page 21, line 29-page 22, line 13. New independent claim 30 incorporates the recitation of claim 14 into that of claim 1. Therefore, claims 29 and 30 are patentable.

New claims 34-36 depend on new claim 33. Because claim 33 is patentable over the cited references, so are these dependent claims.

The new claims 31-36 are also patentable over the cited references because, for the reasons discussed above, the cited references may not be properly combined to reject these claims.

## 2. Other Rejections

In the final Office Action, various claims were also rejected as follows.

Claim 14, which depends on claim 1, is rejected over Nonninger, Mukherjee and Bitterlich, and further in view of Valente (US Patent No. 5,244,691), which is cited for teaching a polymer formed from hexamethylenetetramine and acetylacetone. Final Office Action at pages 7-8. Nonninger, Mukherjee, and Bitterlich teaches as above. Valente fails to teach or suggest the elements missing, based on the combined teachings of Nonninger, Mukherjee and Bitterlich, from claim 1. Therefore, withdrawal of this rejections is respectfully requested.

Claim 15, which depends on claim 1, is rejected over Nonninger, Mukherjee and Bitterlich, and further in view of Haruta (US Patent App. No. 2003/0152704), which is cited for teaching that a dip coating slurry may contain, in addition to the metal oxides, a metal halide. Final Office Action at pages 8-9. Claims 8, 12, and 16-18, all of which depend on claim 1, are rejected over Nonninger, Mukherjee and Bitterlich, and further in view of Lee *et al.* (J. Mater. Res., 1993, 8 (12): 3151-57), which is cited for indicating how oxide concentration, solution viscosity, and the rate of withdrawal affects final coating properties such as thickness and uniformity. Final Office Action at pages 9-10. Claims 24, 26, and 28, all of which ultimately depend on claim 1, are rejected over Nonninger, Mukherjee and Bitterlich, and further in view of Seabaugh *et al.* (US Patent App. No. 2003/0003237), which is cited for teaching a method of applying a YSZ coating via a wet chemistry method on various substrates. Final Office Action at pages 11-13.

As Haruta, Lee, or Seabaugh also fail to teach or suggest the elements missing, based on the combined teachings of Nonninger, Mukherjee and Bitterlich, from claim 1, withdrawal of these rejections is respectfully requested.

### III. CONCLUSION

Applicants believe that the present application is now in condition for allowance. Favorable consideration of the application as amended is respectfully requested. If a telephonic interview would advance examination, the Office is invited to telephone the Applicants' attorney at the number provided below.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check or credit card payment form being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicants hereby petition for any such relief that may be necessary in connection with the examination of the presently pending claims and authorize any such extension under 37 C.F.R. §1.136 and authorize payment of any such extensions fees or petition fees to Deposit Account No. 19-0741.

Respectfully submitted,

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